



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,236	04/06/2004	Kyle Baldwin	2156-608A	7473

7590 01/19/2007
John L. Cordani
Carmody & Torrance LLP
P.O. Box 1110
50 Leavenworth Street
Waterbury, CT 06721-1110

EXAMINER

SULLIVAN, CALEEN O

ART UNIT	PAPER NUMBER
----------	--------------

1756

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/820,236

Applicant(s)

BALDWIN ET AL.

Examiner

Caleen O. Sullivan

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/06/2004; 08/15/2006</u> | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

2. Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 includes the limitation, "... depositing metal onto the substrate..." but claim 1 fails to state if the metal is deposited on the imaged layers.

Claims 3-4 recite limitations, which are in parenthesis; therefore it is unclear if applicant is actually claiming what is stated within the parenthesis.

Claim 4 recites the limitation "... and the exposure time of the second photoimageable film is between about 5 and about 20mJ..." It appears that a range of cure energy is being claimed and should be recited as such by using appropriate language. Appropriate correction is required.

Claim 14 recites the limitation "... and the protective cover layer is removed." There is insufficient antecedent basis for this limitation in the claim.

Claim 15 is stated as depending from claim 15. Correction is required stating the proper claim from which Claim 15 depends.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-10 and 16-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Minter ('035).

Minter ('035) discloses a method of forming T-shaped metal contacts on a dielectric substrate. The method comprises depositing a first photoresist composition onto a substrate to form a first photoresist layer. (See, col.4, 60-62). Then a second photoresist composition is deposited onto the first photoresist layer to form a second photoresist layer. (See, col. 4, 63-65). This teaches the limitations of claim 1 where a first photoimageable layer is provided on a substrate with a second layer.

A non-imaging exposure step occurs after the layers are deposited onto the substrate. (See, col.8, 37-41). This is followed by an image wise exposure of both layers individually or simultaneously, and a step of developing the photoresist layers individually or simultaneously. (See, col. 5, 11-25). In Example 1 (See, col.10, 48-51) the development of the resist stack lasts for 2 minutes, which overlaps with the time ranges recited for development dwell time recited in claim 3. After the development step a layer of metal is deposited onto the upper surface of the second photoresist layer. (See, col.10, 1-6). Then the entire construction is soaked in a solvent so the metal layer on top of the photoresist layers that are dissolved can be lifted off, which leaves a well-defined T-gate and metal contacts on the upper surface of the substrate. (See, col. 10, 14-21). This disclosure teaches the limitations of claim 1 where uncured areas of the first and second photoimageable layers are developed off to produce an image on the substrate over which a metal is deposited, and the subsequent stripping of the first and second film layers from the substrate leaving the metal pattern on the substrate.

Art Unit: 1756

Minter ('035) discloses the two photoresist layers coated on the substrate are different types of positive acting photoresist layers that have distinctly different solubility. (See, col. 5,65-col.6, 2). This disclosure meets the limitations of claim 2 and 3. Minter ('035) further explains the T-gate metal contact, which is a ledge formed at the upper surface of the first layer of photoresist, forms because the cavity in the surface of photoresist layer 2 after development is narrower as it approaches the first layer of photoresist. (See, col. 9, 55-67). This disclosure teaches the limitation of claim 16 where after development the second photoimageable film overhangs the first photoimageable film.

Minter ('035) also discloses possible compositions for each photoresist layer coated on the substrate. The photoresist layers can be a mixture that includes a binder resin such as poly(4-hydroxystyrene), a monomer such as polymethylmethacrylate- methacrylic acid, and a photo sensitizer that is comprised of hydroxyl benzophenones, which are then mixed together with a suitable solvent. Minter ('035) also discloses that other conventional additives such as dyes, adhesion promoters, or non-ionic surfactants can be added to the photoresist composition of either layer before deposition on the substrate. This disclosure teaches the limitations of claims 5-10.

Minter ('035) further discloses the metal layer can be applied by techniques that include sputtering as recited in claim 17, and that any suitable metal for deposition includes any metal that is typically used in the formation of microelectronic devices, which includes gold as recited in claim 18. (See, col. 10, 6-11). This disclosure meets the limitations of claims 17-18.

Minter ('035) teaches all the limitations of claims 1-10 and 16-18.

5. Claims 1-3 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Lai ('967).

Lai ('967) teaches a method of fabricating submicron T-shaped gates for field effect transistors. As part of the method a first, second and third layer of photoresist are deposited over

Art Unit: 1756

each other onto a substrate. (See, col. 3, 38-43). Then all three layers are simultaneously exposed to using an electron beam lithography system to form exposed regions in the three layers of photoresist. (See, col. 3, 46-47). The three layers are developed to form an opening, and then metal is evaporated on top of the remaining photoresist and fills the opening formed. Acetone is used to lift off the photoresist layers, and the metal that is on the top photoresist layer in order to obtain a submicron T-gate. (See, col. 3, 54-56). This disclosure teaches the limitations of claim 1.

Lai ('967) explains that the three photoresist layers formed on the substrate consist of two types of photoresist with different electron beam sensitivities and resolutions. (See, col.3, 57-59). As a result Lai ('967) discloses an overhang is formed at the third or uppermost layer of photoresist over the second or lower layer of photoresist, as recited in claim 16. (See, col. 4, 5-13). Lai ('967) explains the overhang is formed from an opening in the third layer of photoresist layer that after development is smaller than an opening in the second layer because the third layer is less sensitive to radiation than the second layer of photoresist. (See, col.4, 5-13). Therefore, this disclosure also meets the limitations of claims 2 and 3.

Lai ('967) teaches all the limitations of claims 1-3 and 16.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1756

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter ('035) in view of Blessington ('928). Minter ('035) is relied upon as discussed in the rejection of claims 1-10 and 16-18 under 35 USC 102(b) above in paragraph 4. However, Minter ('035) fails to disclose a step where the development dwell time (in 1% potassium carbonate at 90°F) of the first photoimageable film is between about 40 and about 60 seconds and the development dwell time of the second photoimageable film is between about 80 and about 120 seconds as recited in claim 3. Minter ('035) also fails to disclose that the cure energy of the first photoimageable film is between about 30 mJ and 100mJ and the cure energy of the second photoimageable film is between about 5 and about 20mJ.

However, Blessington ('928) teaches a process that uses a potassium carbonate developing solution. Blessington ('928) discloses a method of screen printing stencil that can be used for printing substrates in the electron substrate fabrication industry. A pattern of resist is applied to a conductive mandrel and then patterned with radiation at an energy level ranging between about 150mJ/cm² to about 1500mJ/cm². (see, col. 3, 20-22; 63-67). The photoresist layer is developed using a solution of potassium carbonate at about .5 to about 2% by weight at a temperature of about 80°F to about 110°F. (See, col.3, 67-col.4, 4). Although Blessington ('928) does not specify a development dwell time for the resist layer, as recited in claim 3, one of ordinary skill in the art could

Art Unit: 1756

determine a proper time based on the type of photoresist used. Therefore, the disclosures in Blessington ('928) meet the limitations of claims 3-4.

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to modify the teachings of Minter ('035) with the teachings of Blessington ('928) because Blessington ('928) teaches that a dilute solution of potassium carbonate can be used to develop a resist layer that is patterned as part of an electronic substrate formation process, which includes a step of electroforming a layer of metal such as gold over the patterned resist layer.

9. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter ('035) in view of Gelorme ('245). Minter ('035) is relied upon as discussed in the rejection of claims 1-10 and 16-18 under 35 USC 102(b) in paragraph 4 above.

Minter ('035) fails to disclose a step where the photoresist composition is coated over a carrier sheet that is selected from a group consisting of polyester and polyethylene terephthalate, after which the solvent is removed as recited in claims 11-12. Minter ('035) also fails to disclose a step where a removable protective layer is applied to the top of the composition, as recited in claim 13. However, Gelorme ('245) teaches such process steps.

Gelorme ('245) teaches a photoresist composition that is useful in the manufacture of printed circuit boards. The composition is applied to a substrate by first coating onto a carrier medium such as Mylar, which is one trade name for polyethylene terephthalate (PET) and other polyester films, and then removing solvent by heating. (See, col.7,10-16). This disclosure teaches the limitations of claims 11-12. After the solvent is removed by drying the carrier medium can be rolled for storage. (See, col. 7,19-21). This disclosure teaches the carrier medium can function as a protective layer for the photoresist, as recited in claim 13.

Art Unit: 1756

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to modify the teachings of Minter ('035) with the teachings of Gelorme ('245) because Gelorme ('245) teaches a photoresist composition can be transferred to a substrate by first applying it to a carrier medium such as a Mylar film, which is dried until most of the solvent is removed, and that film on which the photoresist is coated can be rolled for storage until it is to applied to the substrate; therefore functioning as a protective layer for the resist.

10. Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter ('035) in view of Bhatt ('517). Minter ('035) is relied upon as discussed in the rejection of claims 1-10 and 16-18 under 35 USC 102(b) in paragraph 4 above.

Minter ('035) fails to disclose a step where the first photoimageable layer is applied to the substrate by lamination using heat and/or pressure, and the protective cover layer is removed as recited in claim 14. Moreover, Minter ('035) does not disclose that a second photoimageable layer is applied over the first photoimageable film layer by lamination using heat and/or pressure, and is imaged with the protective layer still in place as recited in claim 15.

Bhatt ('517) teaches a method of preparing as substrate for plating. In this method a first photoimageable layer is vacuum laminated onto the substrate. (See, col. 4, 44-51). Then an aqueous photoimageable film is vacuum laminated onto the surface of the first film layer. (See, col. 4, 51-54). This disclosure teaches the limitations of claims 14-15.

It would have been obvious to one of ordinary skill in the art to modify the teachings of Minter ('035) with the teachings of Bhatt ('517) because Bhatt teaches that vacuum lamination is another method by which multiple layers of photoimageable film can be applied to a substrate on which a metal pattern is to be formed.

Art Unit: 1756

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caleen O. Sullivan whose telephone number is 571-272-6569. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

COS
01-16-07



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700